## Space Weather Forecast

Issued on Monday 7 October 2024 at 01:17 Local

**This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: G1/Minor Storm likely early on day 1 (07 Oct) and possibly late on the UTC day. Isolated R1/R2 (Minor to Moderate) Radio blackouts expected on all days.**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** High activity with multiple Moderate-class flares during the past 24 hours, with a peak M2.4 flare observed from a complex sunspot region located in the southwest quadrant.

There are eight sunspot groups on the visible disc. The second largest and most active flaring region is located in the southwest, maintained a complex magnetic configuration, but saw decay in its intermediate and trailer spots. Similarly, another large region to the west of this underwent slow decay in its intermediate portion. The remaining regions appear broadly similar, though with some slight growth evident in the large region in the northeast. This region has been largely stable and inactive in the past 24 hours however.

There is a large 'filament' (arc of plasma) in the south central part of the Sun - given its location this is something to monitor for any possible Coronal Mass Ejection (CME) should it destabilise.

No Earth-directed CMEs were observed in the past 24 hours.

**Solar Wind / Geomagnetic Activity:** The awaited Strong-class flare-related CME from 03 Oct arrived at Earth early on 06 Oct with a modest enhancement to solar wind parameters. The solar wind varied between Slightly Elevated and Normal Background speeds for much of the period, increasing to between Elevated and Slightly Elevated levels (peak 538km/s at 06/1028 UTC) following the CME arrival. The Interplanetary Magnetic Field (IMF) fluctuated largely around the Weak to Moderate threshold, but was enhanced to Moderate to Strong levels following passage of the CME front (peak 17nT at 06/1414 UTC). The north-south component was weak initially, but strengthened to become Moderate to Strong after the CME arrival.

The net result of the above solar wind measures was Quiet (Kp0-2) to Unsettled (Kp3), with an Active (Kp4) interval (06/1500-1800 UTC).

**Energetic Particles / Solar Radiation:** No solar radiation storms were observed.

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**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Solar activity is Expected to be Moderate, with a slight chance of increasing to High levels given a risk for isolated Strong flares, mainly from the two large regions in the southwest disc. Recurrence does not suggest any returning large regions over the eastern solar horizon in the forecast period, however there should now be a slight depopulation of the southwestern quadrant by UTC midweek to slightly reduce the overall flare probabilities by this time.

**Solar Wind / Geomagnetic Activity:** Solar winds have increased to between Elevated and Slightly Elevated levels following the arrival of the CME that left the Sun on 03 Oct. Speeds should slowly decline in the coming days as CME effects subside. There is a chance of a glancing impact late on Day 1 (07 Oct) or early Day 2 (08 Oct) from a CME that left the southwest quadrant of the Sun on 04 Oct.

The only fast wind in the forecast is likely from a small equatorial coronal hole in the western disc, which may become geoeffective later on Day 1 or early Day 2 (07 or 08 Oct), but may be indistinguishable from the residual enhancements caused by the recent CME arrival. Speeds for the high speed stream are unlikely to exceed 500km/s.

Geomagnetic activity is likely to be mostly Unsettled to Active, with a Chance of reaching G1/Minor Storm levels early Day 1 (07 Oct) resulting from the recent CME arrival. Geomagnetic activity is forecast to be mostly Quiet to Active on Day 2 (08 Oct), but there is a Chance of further G1 activity resulting from minor coronal hole or CME enhancements on both these days. Becoming mostly Quiet to Unsettled by Days 3 and 4 (09-10 Oct).

**Energetic Particles / Solar Radiation:** There is a daily chance of exceeding the S1/Minor Storm threshold should further significant flares occur.

## Geomagnetic Storms

| Geomagnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| **Minor or Moderate** | **G1 to G2** | Yes | 60 | 20 | 1 | 1 |
| **Strong** | **G3** | No | 1 | 1 | 1 | 1 |
| **Severe** | **G4** | No | 1 | 1 | 1 | 1 |
| **Extreme** | **G5** | No | 1 | 1 | 1 | 1 |

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## Radio Blackouts - X-Ray Flares

| X-Ray Flares | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|---|---|---|---|---|---|---|
| Probability | | | (%) | (%) | (%) | (%) |
| Active | R1-R2 (M Class) | Yes | 85 | 85 | 70 | 60 |
| Very Active | R3-R5 (X Class) | No | 15 | 15 | 10 | 10 |

## Solar Radiation Storms (High Energy Protons)

| Radiation Storms | Level ($cm^{-2}sr^{-1}s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|---|---|---|---|---|---|---|
| Probability (Exceedance) | | | (%) | (%) | (%) | (%) |
| Active | ≥ S1 | No | 30 | 30 | 20 | 10 |
| Very Active | ≥ S3 * | No | 5 | 5 | 5 | 5 |
| * S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$) | | | | | | |

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